Listing of Claims:

Claim 1 (currently amended): A method for determining configuration parameters describing a physical system, the method comprising the steps of:

measuring an output signal from the system in response to an input signal, the output signal being related to the configuration parameters by a linear operator equation, and

directly reconstructing each of the configuration parameters by applying a prescribed mathematical algorithm to the output signal for solving the linear operator equation.

Claim 2 (original): The method as recited in claim 1 wherein said step of directly reconstructing includes the step of computing a configuration parameter function.

Claim 3 (original): The method as recited in claim 1 wherein said step of directly reconstructing includes the step of computing a configuration kernel.

Claim 4 (original): The method as recited in claim 1 wherein said step of directly reconstructing includes the step of computing a configuration parameter response function for each of the configuration parameters.

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Claim 5 (currently amended): A method for estimating a loop composition in terms of loop parameters representative of the loop composition comprising the steps of:

energizing the loop from a measurement end with an energy source;

measuring a response signal from the loop at the measurement end, wherein each of the loop parameters is related to the response signal by a linear operator equation, and

directly reconstructing each of the loop parameters by executing a prescribed mathematical algorithm, determined with reference to the linear operator, on the response signal for solving the linear operator equation.

Claim 6 (original): The method as recited in claim 5 wherein said step of directly reconstructing includes the step of computing a loop parameter function.

Claim 7 (originals): The method as recited in claim 5 wherein said step of reconstructing includes the step of computing a loop kernel.

Claim 8 (original): The method of claim 5 wherein said step of directly reconstructing includes the step of computing a parameter response function for each of the loop parameters.

Claim 9 (original): A method for estimating a loop composition of a subscriber loop in terms of loop parameters $X_1, X_2, \ldots, X_i, \ldots, X_N$, the loop having a frequency-domain response $H(\omega, X_1, X_2, \ldots, X_i, \ldots, X_N)$ for the loop parameters, the method comprising the steps of

(a) determining a range for each loop parameter X_i.

(b) for each loop parameter X_i, generating a frequency-domain loop parameter function $F_{X_i}(\omega)$ wherein

$$F_{X_i}(\omega) = \int_{X_1}\int_{X_2}\cdots\int_{X_i}\cdots\int_{X_N} X_i H(\omega, X_1, X_2, \ldots, X_i, \ldots, X_N)\, dX_1 dX_2 \ldots dX_i \ldots dX_N,$$

(c) generating a loop kernel $k(\omega, \beta)$ for all loop parameters wherein

$$k(\omega, \beta) = \int_{X_1}\int_{X_2}\cdots\int_{X_N} H(\omega, X_1, X_2, \ldots, X_N)\; H(\beta, X_1, X_2, \ldots, X_N)\; dX_1 dX_2 \ldots dX_N,$$

(d) generating a parameter response function $g_i(\beta)$ for each loop parameter from the integral relation $F_{X_i}(\omega) = \int_{\beta} k(\omega, \beta)\, g_i(\beta) d\beta$,

(e) energizing the loop from a measurement end with an energy source,

(f) measuring a response signal $H_R(\omega) = H(\omega, X_1, X_2, \ldots, X_i, \ldots, X_N)$ for the loop at the measurement end, and

(g) directly determining each loop parameter X_i from the integral relation

$$X_i = \int_{\beta} H_R(\beta)\, g_i(\beta) d\beta.$$

Claim 10 (original): The method as recited in claim 9 wherein step (e) includes the step of computing the inverse of $k(\omega, \beta)$.

Claim 11 (original): The method as recited in claim 9 wherein step (e) includes the step of computing the inverse of $k(\omega, \beta)$ using singular value decomposition.

Claim 12 (original): The method as recited in claim 11 wherein step (f) includes the step of filtering noise from the response signal.

Claim 13 (currently amended): A system for generating the loop composition in terms of loop parameters representative of the loop composition, said system comprising

a source of waves for energizing the loop from a measurement end,

a detector for detecting a response signal from the loop at the measurement end, wherein each of the loop parameters is related to the response signal by ~~an integral~~ a linear operator equation, and

a reconstructor for directly reconstructing each of the loop parameters by executing a prescribed mathematical algorithm, determined with reference to the ~~integral~~ linear operator equation, on the response signal.

Claim 14 (original): The system as recited in claim 13 wherein said reconstructor includes a processor for computing a loop parameter function.

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Claim 15 (original): The system as recited in claim 13 wherein said reconstructor includes a processor for computing a loop kernel.

Claim 16 (original): The system as recited in claim 13 wherein said reconstructor includes a processor for computing a parameter response function for each of the loop parameters.

Claim 17 (new): The method as recited in claim 1 wherein said linear operator equation is equation (6).

Claim 18 (new): The method as recited in claim 5 wherein said linear operator equation is equation (6).

Claim 19 (new): The system as recited in claim 13 wherein said linear operator equation is equation (6).